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(54) **Easily tearable film and pouch made therefrom.**

(57) An easily tearable plastic film (1) having a thin-walled part therein for easy tearing, said thin-wall part being made by incorporating strings (2) into the plastic film during its production by melt extrusion and a method for producing said film are disclosed.

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BACKGROUND OF THE INVENTION

The present invention relates to a packing pouch which is easy to open.

The conventional method of opening a pouch is by cutting it with a knife or scissors or by tearing it at a notch formed in it. The former method is not practicable when a knife or scissors are not at hand; and the latter method does not permit two sheets of film or laminate constituting the pouch to be torn straight and neat in the same direction because of their lack of directional property. Another disadvantage of opening by tearing is the difficulty of tearing up the strong heat-sealed part of the pouch.

There have been proposed several means to eliminate these disadvantages. For example, Japanese Patent Laid-open No. 123256/1981 discloses a pouch that can be opened straight by the aid of a uniaxially oriented tape bonded to the pouch in the direction in which the pouch is to be torn. Japanese Patent Laid-open No. 26450/1984 and 13661/1985 disclose a pouch provided with a string which is attached to the inside of one of the sheets constituting the pouch, so that one side of the pouch can be opened by pulling the string.

A disadvantage of the pouch mentioned first is the increased production cost due to the additional steps and materials for bonding a uniaxially oriented tape to the pouch. Moreover, the uniaxially oriented tape does not reduce the inherent tear resistance of the pouch. A disadvantage of the pouch mentioned second is the necessity of a special apparatus for accurately attaching a tab to the end of the tearing string. Moreover, pulling the string to tear open the pouch must overcome a great resistive force.

SUMMARY OF THE INVENTION

It is primary object of the present invention to provide an easily tearable plastic film having a thin-walled part therein for easy tearing, said thin-wall part being made by incorporating strings in the plastic film when the latter is produced by melt extrusion.

It is an object of the present invention to provide an easily tearable pouch formed by sealing two webs, each comprising a resin layer formed by melt extrusion and two parallel strings, so that the pouch can be torn easily along one of the two strings when a tear is made between the two parallel strings.

It is another object of the present invention to provide a method for producing a film for a packing pouch which is easily openable.

4. Brief Description of the Drawings:

Fig. 1 is a plan view of the pouch of the present invention.

Fig. 2 is a plan view of the pouch when it is being opened.

Figs. 3 and 4 are sectional views of the laminate into which strings are incorporated.

Fig. 5 is a partial sectional view of a two-layer laminate containing two strings for easy tear.

Fig. 6 is a partial sectional view of a resin-coated paper containing two strings for easy tear.

Fig. 7 is a partial sectional view of an unsupported film containing two strings for easy tear.

Figs. 8 and 9 are partial sectional views illustrating how the structure in the vicinity of the string changes as the result of heat treatment.

Fig. 10 is a perspective view showing an apparatus used for producing the easily tearable pouches according to the present invention.

Fig. 11 is a perspective view showing a web which is being converted into pouches.

The reference numbers have the following meaning:

1 ...
Pouch
2 ...
String
3 ...
Notch
4 ...
Seam
4A ...
Bottom seam
4B ...
Side seam
5 ...
Bobbin
6 ...
T-die
7 ...
Extruder
8 ...
Cooling roll
9 ...
String tension roller
10 ...
Nip roll
11 ...
Cutter
12 ...
Side cutter
13 ...
Easy tear film
13A ...
Upper side of web for pouches
13B ...

Lower side of web for pouches
A, B, D, F, G, I ...
Substrate film
C, E, H, J ...
Extruded film
K ...
Aluminum foil
L ...
Paper
M, P ...
Adhesive
N ...
Coextruded bonding resin

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

It was found that the above-mentioned problems can be solved if a string is incorporated into a plastic film at the time of its melt extrusion. The string causes the formation of a thin-walled part in the plastic film or laminate because it does not fuse into the plastic film even if it is of the same material as the plastic film. The thin-walled part may be properly controlled for its thickness by selecting a string of an adequate diameter.

The pouch pertaining to the present invention is constructed of two sheets of plastic film or laminate, each having incorporated two parallel strings, in such a manner that the two strings of one sheet coincide with the two strings of the other sheet. A notch to facilitate tearing is formed in that part of the pouch which is enclosed between the two parallel strings. When the pouch is torn at this notch, the tear runs through along one of the two strings (which forms the thin-walled part). The two strings should be arranged apart at a proper distance, which is preferably 2-10 mm. If the two strings are too close to each other, it is difficult to make a notch between them. If the two strings are too far apart, the tear does not run straight but gives rise to an unsightly open mouth.

The string that can be used in the present invention may be of synthetic fibers, natural fibers, or metallic fibers. It may be in the form of monofilament, multifilament, or twisted staple fiber. The synthetic fibers include nylon (polyamide) fiber, polyester fiber, polyethylene fiber, polypropylene fiber, acrylonitrile fiber, vinylon fiber, carbon fiber, polyimide fiber, and polycarbonate fiber. These synthetic fobers should preferably be stretched (oriented) fibers which have a sufficient strength, although this is not essential because the string is not pulled when the pouch is opened (oriented or stretched strings are readily available). The natural fiber includes cotton, linen, silk and wool. The string may be made of a mixture of synthetic fiber and natural fiber.

The easily tearable plastic film of the present invention was realized by incorporating strings into a plastic film. The string forms a thin-walled part in the plastic film, and this thin-walled part is the weakest spot in the plastic film. The same holds true in the case of laminate with other plastic films, aluminum foil or paper. The pouch of the present invention is easy to tear open owing to the two parallel strings incorporated therein, because the tear runs along one of the strings where the plastic film or laminate is weakest.

The invention will be described in more detail with reference to the following examples, which are not intended to restrict the scope of the invention.

Example 1

A laminate web into which strings are incorporated was prepared in the following manner using an apparatus as shown in Fig. 10. A web of unstretched polypropylene film B (50 μm thick) was passed through the apparatus for lamination with a 30-μm thick film of polypropylene resin (having a melt index of 23) extruded at 230 °C from the T-die 6. Simultaneously with lamination, strings 2 (uniaxially stretched polypropylene monofilaments, 50 μm in diameter or 16 denier) were unwound from the bobbins 5 and incorporated into the laminate web 13. The line speed for lamination was 100 m/min. The resulting laminate is composed of a substrate film B and a coated film C, as shown in Fig. 8. It should be noted that since the diameter of the string, which is 50 μm, is greater than the thickness of the coated film C, which is 30 μm, the string swells the coated film. The swollen parts clearly indicate the positions of the strings. The film swelling by strings may be avoided by using thinner strings, if it is undesirable. The thus prepared laminate web was further combined by dry lamination with a polyester-aluminum laminate which is formed by dry lamination of a 12-μm thick polyester film A and a 7-μm thick aluminum foil K with a polyurethane adhesive P (4.5 g/m^2). The dry lamination was achieved by coating the aluminum foil K with a polyurethane adhesive (4.5 g/m^2). The resulting laminate was made into side seam pouches as shown in Fig. 11). The two laminate webs were placed one over the other, with the coated film inside, in such a manner that strings in one web coincide with strings in the other web. The two webs were heat-sealed to form the bottom seam 4A and side seam 4B and finally cut into individual pouches.

The laminate produced as shown in Fig. 10 has eight strings so that two pouches can be made from each cut in the crosswise direction. This is only an illustration, and the present invention is not restricted to it. In this embodiment, the distance of

the parallel strings was 5 mm. The heat-sealed pouches were finished by forming a notch between the two strings. The thus obtained pouch could be easily and neatly opened because the tear ran from the notch along one of the two strings as shown in Fig. 2. The sealed part was also easily torn apart.

Example 2

A laminate web into which strings are incorporated was prepared in the following manner using an apparatus shown in Fig. 10. A web of unstretched polypropylene film B (50 μm thick) was passed through the apparatus for lamination with a 7-μm thick aluminum foil K which was fed between the T-die 6 and the cooling roll 8 from a let-off roll (not shown). Adhesion of the polypropylene film B to the aluminum foil was accomplished by a composite film coextruded from the T-die at 230°C. This composite film is composed of a 27-μm thick layer of polypropylene (having a melt index of 23) and a 3-μm thick layer of bonding resin (having a melt index of 50), with the bonding resin layer being in contact with the aluminum foil. Simultaneously with lamination, strings 2 (uniaxially stretched polypropylene monofilaments, 40 μm in diameter or 10 denier) were unwound from the bobbins 5 and incorporated into the laminate web 13. The line speed for lamination was 100 m/min. The resulting laminate is constructed as shown in Fig. 9 (before heat treatment). It should be noted that the string slightly swells the aluminum foil K and the polypropylene film I. To increase bond strength between the aluminum foil K and the coextruded bonding resin, the laminate underwent heat treatment for 1 second, with the aluminum foil in contact with a hot roll (200°C, 600 mm in diameter). This heat treatment changed the structure of the laminate as shown in Fig. 9 (after heat treatment). It should be noted that the swollen surfaces of the laminate are smoothed out by heating. The heat-treated laminate web was further combined by dry lamination with a 12-μm thick polyester film. The dry lamination was achieved by coating the aluminum foil K with a polyurethane adhesive (4.5 g/m²). The resulting laminate was made into side seam pouches in the same manner as in Example 1. The thus obtained pouch could be easily opened because the tear ran from the notch along one of the two strings.

Example 3

A laminate web into which strings are incorporated was prepared in the following manner using an apparatus as shown in Fig. 10. A web of 12-μm thick polyester film B coated with an imine-type undercoat (0.1 g/m²) was passed through the apparatus for lamination with a 50-μm thick film of low-density polyethylene (having a melt index of 8) extruded at 320°C from the T-die 6. Simultaneously with lamination, strings 2 (uniaxially stretched polypropylene monofilaments, 30 μm in diameter or 6 denier) were unwound from the bobbins 5 and incorporated into the laminate web 13. The line speed for lamination was 120 m/min. The resulting laminate is constructed as shown in Fig. 5. It was made into side seam pouches in the same manner as in Example 1. The thus obtained pouch could be easily opened because the tear ran from the notch along one of the two strings.

Example 4

A laminate web into which strings are incorporated was prepared in the following manner using an apparatus shown in Fig. 10. A web of mirror-coat paper (74 g/m²) B was passed through the apparatus for lamination with a 50-μm thick film of low-density polyethylene (having a melt index of 8) extruded at 320°C from the T-die 6. Simultaneously with lamination, strings 2 (uniaxially stretched polypropylene monofilaments, 30 μm in diameter or 6 denier) were unwound from the bobbins 5 and incorporated into the laminate web 13. The line speed for lamination was 120 m/min. The resulting laminate is constructed as shown in Fig. 6. It was made into side seam pouches in the same manner as in Example 1. The thus obtained pouch could be easily opened because the tear ran from the notch along one of the two strings.

Example 5

A web of unsupported film into which strings are incorporated was prepared in the following manner using an apparatus shown in Fig. 10. A low-density polyethylene (having a melt index of 3.0) was extruded at 250°C from the T-die 6 into a 110-μm thick film. Simultaneously with extrusion, strings 2 (uniaxially stretched nylon monofilament, 64 μm in diameter or 26 denier) were unwound from the bobbins 5 and incorporated into the polyethylene film. The line speed was 30 m/min. The resulting film is constructed as shown in Fig. 7. It was made into side seam pouches in the same manner as in Example 1. The thus obtained pouch could be easily opened because the tear ran from the notch along one of the two strings.

Effect of the invention

According to the present invention, strings are incorporated into a web at the same time when the resin layer is formed by extrusion in the usual way. And the web in which strings are incorporated is

formed into pouches in the usual way. Therefore, the method of the present invention does not need any modification in the conventional extrusion process and apparatus. The pouches of the present invention have the same appearance as the conventional ones which are not fabricated for easy tear, because they have no tapes or the like for easy tearing. In addition, they need only a small amount of additional production cost. Owing to the strings incorporated therein, the pouches can be easily torn open at the notch, without the need of scissors, because the tear runs along one of the parallel two strings.

Claims

1. An easily tearable plastic film having a thin-walled part therein for easy tearing, said thin-walled part being made by incorporating two strings (2) parallel to each other in the plastic film when the latter is produced by melt extrusion.

2. An easily tearable pouch (1) formed by sealing two webs, each comprising a resin layer formed by melt extrusion and two parallel strings (2) incorporated into the resin layer simultaneously with melt extrusion in such a manner that the two strings (2) in one web coincide with the two strings (2) in the other web, so that the pouch (1) can be easily torn along one of the two strings when the tear is made between the two parallel strings, said resin layers being optionally laminated with a plastic film, aluminum foil, or paper.

3. The easily tearable film or pouch according to claim 1 or claim 2, wherein the strings (2) are selected from synthetic fibers, natural fibers or metal fibers.

4. A process for producing an easily tearable plastic film according to claim 1 or 3 by melt extrusion of a film forming plastic material, characterized in that during the melt extrusion step two strings are incorporated into the molten film parallel to each other.

FIG. 1

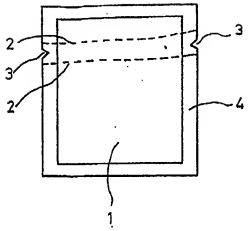


FIG. 2

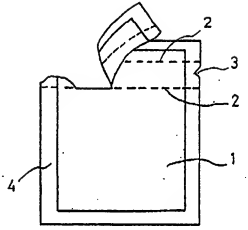


FIG. 3

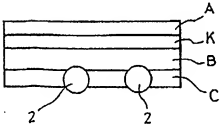


FIG. 4

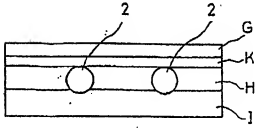


FIG. 5

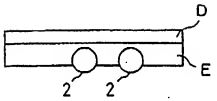


FIG. 6

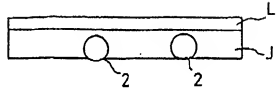


FIG. 7

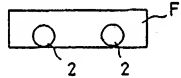


FIG. 8

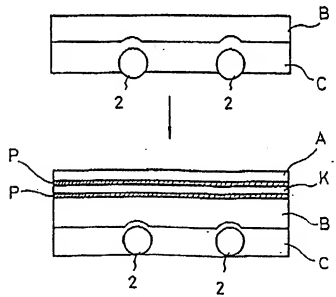


FIG. 9

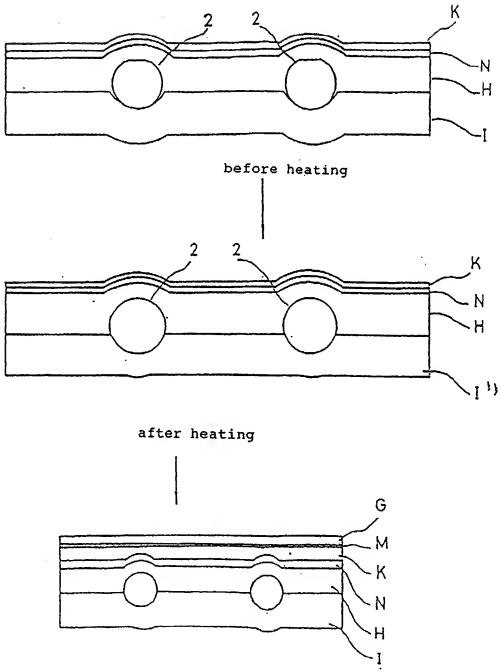


FIG. 10

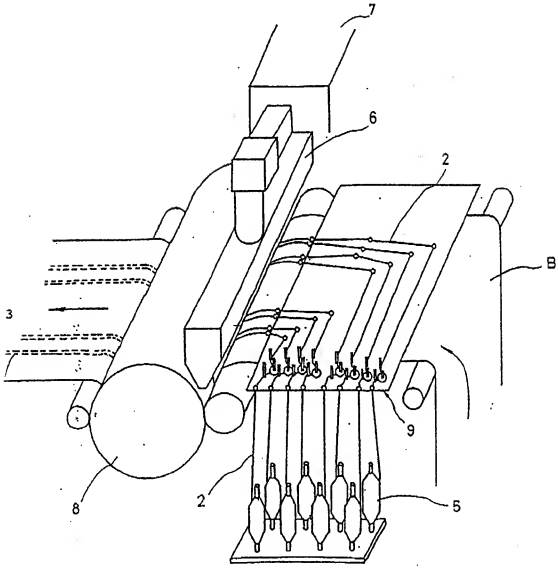
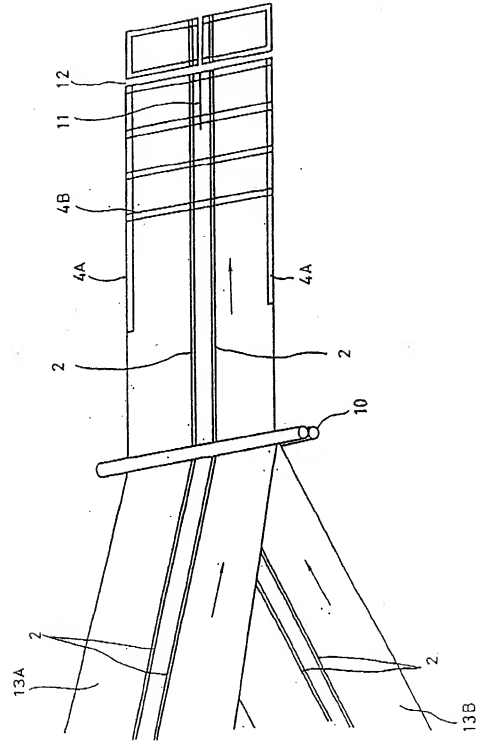


FIG. 11



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 11 2456

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DRAHT. vol. 39, 1 March 1988, BAMBERG DE page 354; 'entwicklung in der ummantelung von flachkabeln mit 2 bis 100 leitern' * the whole document * *	1,3,4	B 29 C 47/06 B 65 D 75/58
A	GB-A-1 147 846 (TOWER PACKAGING COMPANY) * page 2, line 33 - line 61; figures * *	1,2	
A	US-A-3 494 538 (S.B.MATTHEWS) * abstract; figures * *	1,2	
A	GB-A-1 335 304 (BRITISH VISQUEEN LTD.) * page 1, line 9 - line 35; figures * *	1,2	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 D
B 29 C

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	26 November 91	ZANGHI A.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same catagory
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